

Claims

What is claimed:

1. A magnetic memory cell comprising:
 - a reference layer having a preset magnetization;
 - a barrier layer adjacent to the reference layer;
 - a sense layer having an alterable magnetization, the sense layer being adjacent to the barrier layer;
 - a first conductive write line electrically connected to the reference layer;
 - a second conductive write line having a gap, the gap being filled by at least a portion of the sense layer; wherein
 - write current conducting through the second conductive write line is at least partially conducted through the portion of the sense layer, the write current increasing a temperature of the sense layer.
2. The magnetic memory cell of claim 1, wherein the sense layer further comprises:
 - a ferromagnetic layer; and
 - an anti-ferromagnetic layer.
3. The magnetic memory cell of claim 1, wherein the sense layer further comprises:
 - a first sub-sense layer;
 - a second sub-sense layer;
 - a spacer layer between the first sub-sense layer and the second sub-sense layer.
4. The magnetic memory cell of claim 3, wherein the first sub-sensor layer and the second sub-sensor layer comprise a magnetic material.
5. The magnetic memory cell of claim 3, wherein the spacer layer comprises a non-magnetic material.

6. The magnetic memory cell of claim 1, wherein write current conducting through the sense layer increases a temperature of the sense layer, and a magnetic coercivity of the sense layer decreases as a temperature of the sense layer increases.
7. A group of magnetic memory cells, wherein the group comprises a plurality of magnetic memory cells of claim 1, forming a layer over a substrate.
8. The group of magnetic memory cells of claim 7, wherein a common second conductive write line conducts write current through portions of the sense layers of each of the magnetic memory cells of the group.
9. A magnetic memory structure comprising:
 - a first group of magnetic memory cells of claim 1, the first group comprising:
 - a first group first layer formed adjacent to a substrate, the first layer comprising a first plurality of magnetic memory cells;
 - a first group second layer formed adjacent to the first layer, the second layer comprising a second plurality of magnetic memory cells; and
 - a common first group conductor connected to each of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells.
10. The magnetic memory structure of claim 9, wherein current flowing through the first common conductor regions thermally heats at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells when at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells is selected.
11. The magnetic memory structure of claim 9, further comprising:
 - a second group of magnetic memory cells, the second group comprising:

a second group first layer formed adjacent to the substrate, the second group first comprising a third plurality of magnetic memory cells;

a second group second layer formed adjacent to the second group first layer, the second group second layer comprising a fourth plurality of magnetic memory cells.

a common second group conductor connected to each of the third plurality of magnetic memory cells and the fourth plurality of magnetic memory cells.

12. The magnetic memory structure of claim 9, wherein current flowing through the first common conductor regions thermally heat at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells when at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells is selected.
13. The magnetic memory structure of claim 9, wherein active devices that control selection of the magnetic memory cell are formed in the substrate.
14. The magnetic memory structure of claim 9, wherein active devices that control sensing of magnetic states of the magnetic memory cell are formed in the substrate.
15. The magnetic memory structure of claim 9, wherein less write current is required to write to a selected group of magnetic memory cells.
16. The magnetic memory structure of claim 9, wherein less write current is required to write to the first, second, third and fourth plurality of magnetic memory cells if corresponding common conductor regions are selected.
17. The magnetic memory structure of claim 9, further comprising first select lines, second select lines and third select lines, the first select lines selecting individual magnetic memory cells of the first group, the second select lines and third select line selecting the first and second pluralities of magnetic memory cells.

18. The magnetic memory structure of claim 17, wherein a first select line, a second select line and a third select line must be selected to write to a magnetic memory cell.
19. The magnetic memory structure of claim 17, wherein only a first select line and a second select line must be selected to read from a magnetic memory cell.
20. The magnetic memory structure of claim 17, wherein the first select lines are column select lines, the second select lines are row enable lines and the third select lines are write enable lines.
21. A magnetic memory structure comprising:
 - a first group of magnetic memory cells, the first group comprising:
 - a first group first layer formed adjacent to a substrate, the first layer comprising a first plurality of magnetic memory cells;
 - a first group second layer formed adjacent to the first layer, the second layer comprising a second plurality of magnetic memory cells; and
 - a common first group conductor connected to each of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells.
22. A magnetic memory cell comprising:
 - a reference layer having a preset magnetization;
 - a barrier layer adjacent to the reference layer;
 - a sense layer having an alterable magnetization, the sense layer being adjacent to the barrier layer;
 - a first conductive write line electrically connected to the reference layer;
 - a second conductive write line having a gap, the gap being filled by at least a portion of the reference layer; wherein

write current conducting through the first conductive write line is at least partially conducted through the portion of the reference layer, the write current increasing a temperature of at least one of the reference layer and the sense layer.

23. A computing system comprising:

- a central processing unit;
- a memory array electronically connected to the central processing unit;
- the memory array comprising a magnetic memory structure;
 - a first group of memory cells, the first group of memory cells comprising:
 - the magnetic memory structure comprising:
 - a reference layer having a preset magnetization;
 - a barrier layer adjacent to the reference layer;
 - a sense layer having an alterable magnetization, the sense layer being adjacent to the barrier layer;
 - a first conductive write line electrically connected to the reference layer;
 - a second conductive write line having a gap, the gap being filled by at least a portion of the sense layer; wherein
 - write current conducting through the second conductive write line is at least partially conducted through the portion of the sense layer, the write current increasing a temperature of the sense layer.

24. The computing system of claim 23, further comprising:

- a second group of magnetic memory cells, the second group comprising:
 - a second group first formed adjacent to the substrate, the second group first comprising a third plurality of magnetic memory cells;
 - a second group second layer formed adjacent to the second group first, the second group second layer comprising a fourth plurality of magnetic memory cell;
 - a third common conductor formed adjacent to at least one of the third plurality of magnetic memory cells and the fourth plurality of magnetic memory cells, the third common conductor causing current to be conducted through a sense layer of the magnetic

memory cells providing thermal heat to at least one of the third plurality of magnetic memory cells and the fourth plurality of magnetic memory cells;
wherein only one of the first group and second group can be selected at a time.

25. A method of writing to a magnetic memory structure, the magnetic memory structure comprising a first layer formed adjacent to a substrate, the first layer comprising a first plurality of magnetic memory cells, a second layer formed adjacent to the first layer, the second layer comprising a second plurality of magnetic memory cell, a first common conductor connected to sense layers of at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells, the first common conductor conducting current through sense layers of the magnetic memory cells providing thermal heat to at least one of the first plurality of magnetic memory cells and the second plurality of magnetic memory cells, the method comprising:
- selecting at least one column select line;
 - selecting at least one row enable line;
 - selecting a write enable line that turns on a corresponding common conductor;
 - and
 - writing to a magnetic memory cells electrically coupled to the common conductor.
26. The method of claim 25, wherein the common conductor is connected to a plurality of magnetic memory cells, and the plurality of magnetic memory cells are simultaneously written to when the common conductor is conducting current.